Patent claims

1. A method for the production of a monodisperse pore-containing ion exchanger, characterized in that

   a) a noncrosslinked monodisperse seed polymer having a particle size of 0.5 to 20 μm is produced by free-radical initiated polymerization of monoethylenically unsaturated compounds in the presence of a nonaqueous solvent,

   b) to an aqueous dispersion of the seed polymer in the presence of a dispersant, at least one monomer feed (A) is added which contains

      0.1 to 5% by weight of initiator and
      95 to 99.9% by weight of monomer

      the monomer feed (A) is allowed to swell into the seed and is polymerized at elevated temperature to give noncrosslinked monodisperse bead polymers

   c) to an aqueous dispersion of the resultant monodisperse bead polymer in the presence of a dispersant, a further monomer feed (B) is added which contains

      0.1 to 3% by weight of initiator,
      5 to 70% by weight of crosslinker,
      15 to 84.9% by weight of monomer and
      10 to 70% by weight of porogen,

      the monomer feed (B) is allowed to swell into the seed and, at elevated temperature, is polymerized to give crosslinked monodisperse bead polymers having a particle size of 10 to 500 μm and

   d) these crosslinked monodisperse pore-containing bead polymers from method step c) are converted by functionalization into monodisperse pore-containing ion exchangers.

2. A method for the production of a monodisperse pore-containing bead polymer having a particle size of 10-500 μm, characterized in that

a) a noncrosslinked monodisperse seed polymer having a particle size of 0.5 to 20 μm is produced by free-radical initiated polymerization of monoethylenically unsaturated compounds in the presence of a nonaqueous solvent,

b) to an aqueous dispersion of the seed polymer in the presence of a dispersant, at least one monomer feed (A) is added which contains

0.1 to 5% by weight of initiator and
95 to 99.9% by weight of monomer

the monomer feed is allowed to swell into the seed and is polymerized at elevated temperature to give noncrosslinked monodisperse bead polymers

c) to an aqueous dispersion of the resultant monodisperse bead polymer in the presence of a dispersant, a further monomer feed (B) is added which contains

0.1 to 3% by weight of initiator,
5 to 70% by weight of crosslinker,
15 to 84.9% by weight of monomer and
10 to 70% by weight of porogen,

allowing the monomer feed to swell into the seed and polymerizing it at elevated temperature.

3. The method as claimed in claim 1) or 2), characterized in that, as dispersant, in step c), use is made of water-soluble cellulose derivatives.

4. A monodisperse pore-containing ion exchanger, preferably monodisperse pore-containing anion or cation exchanger obtainable by

a) producing a noncrosslinked monodisperse seed polymer having a particle size of 0.5 to 20 μm by free-radically initiated polymerization of monoethylenically unsaturated compounds in the presence of a nonaqueous solvent,

b) adding at least one monomer feed (A) to an aqueous dispersion of the seed polymer in the presence of a dispersant which contains

0.1 to 5% by weight of initiator and
95 to 99.9% by weight of monomer,

swelling the monomer feed (A) into the seed and polymerizing at elevated temperature to give noncrosslinked monodisperse bead polymers and

c) adding a further monomer feed (B) to an aqueous dispersion of the resultant monodisperse bead polymer in the presence of a dispersant which contains

0.1 to 3% by weight of initiator,
5 to 70% by weight of crosslinker,
15 to 84.9% by weight of monomer and
10 to 70% by weight of porogen,

allowing the monomer feed (B) to swell into the seed and polymerizing at elevated temperature to give crosslinked monodisperse bead polymers having a particle size of 10 to 500 μm and

d) functionalizing these crosslinked monodisperse pore-containing bead polymers from method step c).

5. A monodisperse pore-containing bead polymer having a particle size of 10-500 μm, obtainable by

a) producing a noncrosslinked monodisperse seed polymer having a particle size of 0.5 to 20 μm by free-radically initiated polymerization of monoethylenically unsaturated compounds in the presence of a nonaqueous solvent,

b) adding at least one monomer feed (A) to an aqueous dispersion of the seed polymer in the presence of a dispersant which contains

0.1 to 5% by weight of initiator and
95 to 99.9% by weight of monomer,

swelling the monomer feed into the seed and polymerizing at elevated temperature to give noncrosslinked monodisperse bead polymers,

c) adding a further monomer feed (B) to an aqueous dispersion of the resultant monodisperse bead polymer from method step b) in the presence of a dispersant which contains

0.1 to 3% by weight of initiator,
5 to 70% by weight of crosslinker,
15 to 84.9% by weight of monomer and
10 to 70% by weight of porogen,

allowing the monomer feed to swell into the seed and polymerizing at elevated temperature.

6. The use of the monodisperse pore-containing anion exchanger obtainable as claimed in claim 4 for removing anions from aqueous or organic solutions and their vapors, for removing anions from condensates, for decolorizing and desalting glucose solutions, wheys, low-viscosity gelatin broths, fruit juices, fruit musts and sugars, beet sugar solutions, fructose solutions, for removing organic components from aqueous solutions, for separating off and purifying biologically active components, and also for the analysis of the ion content of aqueous solutions by ion-exchange chromatography.

7. The use of the monodisperse pore-containing cation exchanger obtainable as claimed in claim 4 for removing cations, color particles or organic components from aqueous or organic solutions and condensates, for softening in the neutral exchange of aqueous or organic solutions and condensates, for the purification and workup of waters in the chemical industry, the electronics industry and from power stations, for the demineralization of aqueous solutions and/or condensates in combination with gel-type and/or macroporous anion exchangers, for decolorizing and desalting wheys, low-viscosity gelatin broths, fruit juices, fruit musts and aqueous solutions of sugars, for separating off and purifying biologically active components, and also for analysis of the ion content of aqueous solutions by ion-exchange chromatography.

8. The use of the monodisperse pore-containing bead polymer obtainable as claimed in claim 5 for separating off and purifying biologically active components from their solutions, for analysis of the ion content of aqueous solutions by ion-exchange chromatography, for removing color particles or organic components from aqueous or

organic solutions, as support for organic molecules such as chelating agents, enzymes and antibodies, for separating off and purifying biologically active components, for removing color particles or organic components from aqueous or organic solutions, or the support for organic molecules such as chelating agents, enzymes and antibodies which are either adsorbed to the support or are covalently or ionically fixed by reaction with a functional group present on the support.